

The TOW Missile— Precise and Powerful

Bill Ruta and C.L. “Claude” Higginbotham

“If there’s one weapon the insurgents don’t want to face in this fight, it is the Tube-launched, Optically-tracked, Wire-guided [TOW] antitank missile launcher. Accurate, powerful, and deadly, it is the biggest weapon in our platoon’s arsenal. Some say the big wire-guided missile went out of fashion after we stopped confronting enemies with heavy mechanized armor. I say otherwise: when it comes to urban fighting, a TOW is a gift from the Pentagon gods.”

—*House to House* by SSG David Bellavia, 2nd Battalion (Bn),
2nd Infantry Regiment, regarding his time in Fallujah, Iraq,
with his Bradley Infantry squad.

A Soldier from Delta Co., 2nd Bn, 27th Infantry Regiment, 3rd BCT, 25th Infantry Division, assembles the ITAS TOW missile system in Riyadh, Iraq. (U.S. Air Force photo by TSgt Maria J. Bare.)

Since 1970, more than 650,000 TOW missiles have been produced. In the last 5 years of persistent conflict, the U.S. Army and U.S. Marine Corps (USMC) have fired almost 9,500 TOW missiles. While there have been many weapon systems developed and produced over the last 4 to 5 decades, TOW remains an extremely effective weapon system, especially given today's enemy in Iraq and Afghanistan.

Even with its originally intended anti-tank purpose, TOW's precision and effectiveness with minimum collateral damage make it particularly suitable for the nontank targets of the current theater environment.

TOW is the world's premier heavy anti-armor and assault weapon system, consisting of crew-portable ground, vehicle-mounted, and helicopter-mounted launcher variants, and 10 missile versions.

TOW is a relatively simple weapon and very reliable. It is also relatively inexpensive compared to many missile systems. This combination of reliability, effectiveness, and affordability has made it a successful weapon system overall. Continuing TOW enhancements provide an affordable path to the future of U.S. precision close combat weapons. Almost 5 decades after it was first fielded, TOW is thriving and remains

one of the most effective and most used weapon systems by the U.S. military.

Redstone's Role

In 1958, a small group met at Redstone Arsenal, AL, home to the U.S. Army Aviation and Missile Command, U.S.

Army Space and Missile Defense Command, numerous program executive offices (PEOs), and major components of the Defense Intelligence Agency and the Missile Defense Agency, to study the technical feasibility of the emerging heavy antitank/assault weapon system requirements for the Army. In 1964, the first TOW Project Management Office (PMO) was established at Redstone. The first TOW missile was fielded in 1970.

For almost 45 years, Redstone's TOW PMO and its successors have been responsible for managing TOW development, production, and sustainment contracts. Today, the Close Combat Weapons System (CCWS) Project Office, part of PEO Missiles and Space (M&S), is responsible for the Javelin and TOW weapon systems.

TOW's Evolution

TOW is the world's premier heavy anti-armor and assault weapon system,



USMC Cpl Joshua Logsdon, Battle Landing Team 22, Combined Anti-Armor Team, 26th Marine Expeditionary Unit, looks through a sight on a TOW missile mounted on top of a HMMWV during a vehicle and weapons static display at Camp Lemonnier, Djibouti. The M220A4 TOW launcher is being replaced with ITAS in both the Army and USMC. (U.S. Air Force photo by A1C Bryan Boyette.)

consisting of crew-portable ground, vehicle-mounted, and helicopter-mounted launcher variants, and 10 missile versions.

TOW can effectively employ in all weather conditions to engage tanks, armored and non-armored vehicles, and various point targets such as bunkers and crew-served weapons. TOW is most often used mounted on vehicles including the

High-Mobility Multipurpose Wheeled Vehicle (HMMWV), Bradley Fighting Vehicle, Stryker Antitank Guided Missile (ATGM) Vehicle, USMC's Light Armored Vehicle-Antitank and Cobra helicopter, and many foreign vehicles. Its successful evolution has seen many improvements, each adding to the capabilities of the Soldier. (See TOW Evolution sidebar on Page 33.)

Current and Future TOWs

Current TOW missile improvements include a bunker buster (BB) variant and replacement of the obsolete wire guidance link with one that operates via radio frequency (RF). The TOW BB, which is just entering the Army and USMC inventories, is optimized for precision assault capability and features a blast fragmentation warhead that can punch through an 8-inch thick, double-reinforced concrete wall from ranges up to 3,750 meters. The RF guidance link is in production with deliveries beginning in FY10. The RF transmitter is part of the missile case with an RF receiver integrated into the missile's aft section. TOW missiles with the RF guidance link are compatible with existing launchers and stowage racks without any hardware or software modifications.

While the unavailability of wire drove the development of TOW RF, modest inherent improvements were achieved, including the elimination of overwater

and power line restrictions, enhanced combined arms applications in urban environments, and greater environmental compliance under training conditions (no recovery of guidance wires needed). The removal of the wire link hardware also creates volume within the airframe that facilitates future technology insertion.

The Improved Target Acquisition System

(ITAS), the latest fire control system for the TOW, has integrated optical and second-generation, forward-looking infrared sights and an eye-safe laser range finder (LRF). It is capable of firing all versions of TOW missiles and can be employed mounted on the HMMWV or dismounted on a tripod. Equivalent capabilities are integrated into the Bradley A3 vehicle with the Improved Bradley Acquisition Subsystem (IBAS) and the Stryker ATGM Vehicle with its modified ITAS (MITAS). The ITAS, IBAS, and MITAS have played a leading role by providing precision assault and antitank fires in *Operations Enduring* and *Iraqi Freedom* (OEF/OIF) since 2003.

The latest upgrade to ITAS incorporates a global positioning satellite-based position attitude determination subsystem (PADS). PADS, when used with the LRF, provides a far target location (FTL) capability that provides gunners with precise 10-digit grid coordinates for their own position and for the selected target. The new capability

makes it possible to direct other weapon system fires and to call in close air support (CAS) or indirect artillery fires. The ITAS FTL was introduced into OEF in May 2008 with Destiny Co., 2nd Bn, 503rd Infantry (Airborne (AB)), 173rd AB Brigade Combat Team (BCT), who employed it with great success.

Weapon of Choice

TOW is used primarily against machine gun and mortar positions, snipers, rocket-propelled grenade teams, command and control elements, field fighting positions, caves, and enemy ambush positions in buildings. In OEF, the Anti-Afghan Forces (AAF) established positions high in the mountains in very rugged terrain that is extremely difficult for U.S. and allied forces to maneuver against; it is also out of range

of most small arms.

AAF then proceeded to engage, inflict maximum damage, and withdraw before CAS or indirect artillery fires could be achieved, giving U.S. and allied troops only a 3- to 5-minute window in which to find, fix, and destroy the enemy.

TOW ITAS solves this problem by providing a long-range, precision weapon that is organic

to the wheeled assault platoon of the Interim BCT. Its ability to quickly engage during that brief time frame is especially important in Afghanistan, since CAS and artillery fires are often not available because of the extensive geographic terrain that forces are trying to control there.

TOW in the Field

TOW gunners are trained on a basic skills simulator to establish and maintain gunner proficiency. The Redstone CCWS Project Office conducts training

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ITAS brings long-range, lethal, anti-armor and precision assault fire capabilities to Soldiers by doubling target acquisition ranges and maximum range engagements with TOW missiles, thus significantly enhancing system lethality and Soldier survivability. (U.S. Army photo by Perry Taylor, CCWS Project Office.)

at unit locations in the field upon delivery of new TOW equipment. They also retrain gunners and new personnel concurrent with equipment reset that returns from Iraq or Afghanistan.

TOW's successes in *OEF* were recounted firsthand by the 173rd AB BCT at the Infantry Warfighting Conference in Columbus, GA, in September 2008. In their assigned area, the terrain was remote, rugged, and austere, making maneuverability very difficult. They faced many challenges in accomplishing both their lethal and nonlethal missions. TOW proved invaluable to both of these efforts.

With attacks numbering no less than four times per day in a 1-month period, TOW was indispensable. The enemy was on high ground at all times and not

easily identifiable—farmers and fighters looked similar within the population. TOW allowed positive identification (PID) of the enemy beyond the range of their heavy weapons. Using the ITAS was the only solution for Destiny Co. to PID and engage prior to being shot at.

The Army's current combat strategy is built around the concept of a light, lethal, and deployable force that relies solidly on a family of sensors and precision weapons.

"It's the fastest, most effective weapon system on the battlefield," recounts CPT Josh Harrison, 173rd AB BCT. "It allows you to PID, engage, and destroy the enemy at range with

zero collateral damage and immediately conduct battle damage assessment. And TOW has serious psychological effects on the enemy in addition to its devastating lethality."

The fight in Afghanistan is more than a kinetic or lethal fight; it is also about connecting with the population. U.S.

forces there have a tremendous nonlethal mission, including collaborating with and training Afghan police, facilitating a weapons turn-in program, providing humanitarian assistance, refurbishing mosques, conducting ceremonies, providing care and support to the population's children, and much more.

With TOW's proven success in winning the fight, insurgent communications were overheard referring to TOW as the "Finger of God" because of its deadly precision and effectiveness on target. When villagers heard this, they gained confidence in U.S. troops and tended to cooperate with them more, making the mission of the 173rd AB BCT perhaps a bit easier.

The 173rd AB BCT made many TOW modifications in the field to adapt to the unique fight in Afghanistan, and has provided the Army with significant input. Some of these modifications include custom turret mounts on vehicles such as up-armored HMMWVs and ground-mounted pedestals in

fortified positions that allow for 360-degree operation for extended periods.

The Army's current combat strategy is built around the concept of a light, lethal, and deployable force that relies solidly on a family of sensors and precision weapons. Within this context, the TOW weapon systems of today, together with forthcoming enhancements, will provide the speed, range, precision, and improved lethality and survivability needed in the field now and far into our military's future.

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TOW Evolution

1962 to 1972—Original Basic TOW

- 3,000-meter range.
- First American-made guided missile fired in combat by U.S. Soldiers in May 1972 at Kontum, South Vietnam.

1978—Extended Range TOW

- Increased maximum range to 3,750 meters.

1981—Improved TOW

- Added extendable probe, improved armor penetration.

1983—TOW 2

- Full caliber warhead, extendable probe.
- Redesigned flight motor, 30 percent greater impulse.
- Improved launcher guidance link.

1987—TOW 2A

- Counters armor threat by Explosive Reactive Armor.
- Uses tandem warhead armament system.
- Used in Iraq assault that killed Uday and Qusay Hussein, July 2003.

1991—TOW 2B

- "Fly-over and shoot-down" missile, two explosively formed penetrator warheads.
- Defeats advanced armor.
- Dual-mode sensor, new armament section equipped with two warheads.
- Complementary weapon to TOW 2A.

1992—ITAS

- Improved target detection, recognition, and engagement.
- Integrated second-generation imaging forward-looking infrared with the optical sight, laser rangefinder, automatic tracking.

2003—TOW BB

- Bunker defeat capability, breaches 8-inch double reinforced masonry.
- 500 TOW BB missiles deployed in support of Stryker BCTs in OIF.
- Available to all BCTs in 2009.
- TOW's sole source wire vendor exits market.

2004—TOW 2B Aero

- Increased maximum range to 4.5 km by adding wire and aerodynamic nose.

2006—TOW 2B RF

- Army contracted production of new wireless TOW 2B RF missile.
- More than 17,000 TOW missiles with RF guidance link have been placed on contract for U.S. Army, USMC, and allied nations.

2008—Introduction of ITAS with FTL capability

- Four ITAS-FTL fielded to 173rd Infantry AB BCT in Afghanistan.
- Four ITAS-FTL fielded to border patrol to support homeland defense.
- FY08 3rd quarter—official fielding of ITAS-FTL to Army and USMC units begins.